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attached. Where no English language counterpart could be found and except for EP0473547A (JP-A-230,645/1992), applicant submits English translations prepared by computer software. Additional references not cited by a foreign patent office are also cited.

Entry of the foregoing submissions into the record of the instant application is requested.

Applicant has amended the disclosure of the specification to correct certain minor typographical errors. Claim 17 has been amended to correct the spelling of the word "from" as kindly noted by the examiner. The deletion of the sentence on page 20, line 13, is due to an inadvertent error relating to a preference and does not introduce new matter. 

In the Office action, the examiner rejected claims 1-33 for indefiniteness under 35 U.S.C. § 112, second paragraph. The examiner takes the view that from the expression in the claims that the "branched segment(s) contains at least two repeating monomer units" it would be unclear where the repeating unit is actually located. Claim 16 has been amended to recite the subsets of the original claim in which the bulk of the acrylic and methacrylic monomers are not in the same segment, to avoid a total of more than 100% and to recite a polymer which lacks styrene (see new Claim 34). Claim amendments are for purposes of clarification and do not constitute new matter. Support for the amendment to Claim 16 and new Claim 34 will be found on original Claim 16. Specifically, original Claim 16 as indicated by the Examiner had as a subset a copolymer which lacked styrene e.g. wherein the copolymer comprised 50% acrylate and 50% methacrylate or any other proportion in which the acrylate and the methacrylate total 100%. In another subset of original Claim 16, the claim was directed to a terpolymer comprising acrylic, methacrylic and styrenic derivatives. The location of each monomer as now recited in Claims 16 and 34 was also a subset of original Claim 16. 

Further in the Office action the examiner raised rejections against certain claims based on prior art. Claims 1-4, 9, 14 and 27-29 are rejected under 35 U.S.C. §102(b) as anticipated by the Yamana et al. publication (SPIE Vol 3333)("Yamana et al."). Claims 1-4, 9-15, 27-30 and 32 are rejected under 35 U.S.C. §102(b) as anticipated by the Houlihan et al. publication (Macromolecules 1997)("Houlihan"). Claims 1 and 5-8 are rejected under 35 U.S.C. §102(b) as anticipated by Schadeli et al. ("EP 473547"). Claims 1-4, 9-15, 27-30 and 32 are rejected under 35 U.S.C. §102(e) as being anticipated by Allen et al (US 6165678 A)("Allen et al."). Claims 1-4, 9-16, 27-30 and 32 are rejected under 35 U.S.C. §102(e) as being anticipated by Breyta et al. (US 5492793 A)("Breyta et al.").

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As shown in the copy of the 1 December 2000 "Reply to Written Opinion", the Exhibit submitted herewith, the instant claims were amended to require the branched polymer to contain branch segments "wherein the branch segment(s) contain at least two repeating monomer units and have a number average molecular weight (M_n) of at least 1,000". It is believed that such claim amendments were carried over into the U.S. National Phase so no separate claim amendment should be necessary but to expedite prosecution, should the Examiner require that a separate amendment be made in the instant application, applicant submits herewith an amendment to Claims 1, 13 and 27 which parallels the amendment entered in Chapter II of the PCT prosecution.

already present.

Support in the specification for the amendment to Claim 1 is found on page 5, lines 18-20 (claim limitation of the branch segment(s) having at least two repeating monomer units) and on page 4, line 20 (claim limitation, expressed as a preference, of the branch segment(s) having the lower limit of a range being about 1,000, i.e., a number average molecular weight of at least 1000). These same portions of the specification in addition provide support for the corresponding amendment made to process Claim 27. Support in the specification for the amendment to Claim 13 is found on page 4, line 20 (claim limitation for the macromonomer component more preferably having a number average molecular weight of about 1,000 to about 15,000).

Nothing in the references relied on by the examiner has been found to teach or suggest a polymer with branch segments having the claimed number average molecular weight. Applicant refers the examiner to the Reply to Written Opinion at page 3 which states:

In response to Section V relating to claims 1-10, 14 and 27-29 not being novel or containing an inventive step over documents D1 (M. Yamana et al.) and D2 (EPO 0 473 547 A), Applicant respectfully submits that such claims now meet the requirements of Article 33(a) PCT in view of the amendments made to claims 1 and 27. In particular, none of the cited documents show or suggest a branched polymer wherein the branched segment(s) not only contain at least two repeating monomer units but also have a number average molecular weight (M_n) of at least 10000 as now recited in claims 1 and 27.

In particular, the EP473547A reference teaches polymers comprised of a repeat unit derived from an olefinic unsaturated onium salt of formula I or II. The polymers of

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EP473547A have sidearms that are much less than 1000 in most cases and under 1000 in all cases specifically disclosed. The largest sidearm has a molecular weight of ~837 as follows:

-Ph-(CH₂)₁₀-CO₂-Ph-Y-Ph, where Y is -S-C₄-alkyl and X is SbCl₆-
MW = ~837.

← is this
MW?

Y can also be -S-C₄-phenylsubstituted alkyl, which incrementally increases molecular weight by 76. Thus the -S-substituted-C₄-alkyl moiety having 2 phenyl substituents would still not give a sidearm exceeding 1000 in molecular weight. Although the Examiner did not raise an obviousness rejection, to expedite prosecution, the applicant wishes to point out that there are no specific disclosures of multi-substituted -S-substituted alkyl moieties in this reference, thus to one of skill in the art impermissible hind-sight knowledge of the claimed invention would be required to modify the disclosure to arrive at the claimed invention. Also the polymers disclosed in EP473547A do not have sidearms which contain at least two repeating units.

The Allen et al. reference teaches polymers having sidearms that are well under 1000. The definitions of the pendant groups R_p and R_{cl} (see columns 2 and 3 of the Allen et al.) are consistent with sidearms having molecular weight values of less than 1000 in all cases specifically taught. With regard to specific molecules exemplified in this reference, the largest monomer affording a sidearm in Allen et al. is the monomer of Example 2 having a molecular weight of 343 grams/mole. The sidearm molecular weight will be somewhat less since part of the monomer molecular weight is methacrylate, which is incorporated into the backbone. The monomer disclosed in Allen et al. that is specifically mentioned in the Office action, i.e. 2-trifluoromethanesulfonylaminoethyl methacrylate, has an even lower molecular weight of 224 g/mole. Also the Allen et al. polymers do not have sidearms which contain at least two repeating units.

The polymers of Breyta et al. are essentially linear polymers or, alternatively, can be considered as branched polymers having sidearms of very low molecular weight. While there is broad disclosure in Breyta et al. of "hydroxystyrene monomer or oligomer component", there is no teaching or suggestion that the oligomer component, if selected, could be used to afford a branched, comb polymer having sidearms as specified above. An oligomeric component, if selected, could be all incorporated in the backbone based on the Breyta et al.

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disclosure. Also the polymers of Breyta et al. do not have sidearms which contain at least two repeating units.

The acrylic polymers of Yamana have sidearms that are well under 1000 (the largest having Mn of 312 for the largest sidearm of copolymer (a) in Fig. 1 on page 37 of Yamana. Also the polymers of Yamana do not have sidearms which contain at least two repeating units.

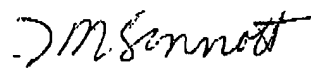
The polymers of Houlihan are essentially linear polymers or alternatively, they can be considered branched polymers albeit branched polymers having short sidearms (that are well under 1000 in Mn values). For example, see the first 3 copolymer structures in Table 1, page 6519 of the Houlihan reference. Also the polymers of Houlihan do not have sidearms which contain at least two repeating units.

In view of the amendments and remarks hereinabove, reconsideration and withdrawal of the rejections under 35 U.S.C. 102(b) and (e) is requested. Allowance of all the claims of the instant application is respectfully requested.

Applicant gratefully acknowledges the examiners indication that Claims 17-26, 31 and 33 are deemed allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim.

The examiner is invited to telephone the undersigned to discuss any issues raised by this response or remaining in this application which discussion may expedite prosecution of the instant application.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In showing the changes, inserted material is bolded and underlined and deleted material is bolded and bracketed.

IN THE SPECIFICATION:

On page 5, line 10 amend as follows:

photosensitive compositions of this invention, typically will contain between about 3% to about 40% by weight of monomer units containing protected acid groups, preferably between about 5% to about 50%, and more preferably between about 5% to about 20%. The branch segments of such a preferred branched polymer typically contain between 35% to 100% of the protected acid groups present. Such a branched polymer when completely unprotected (all protected acid groups converted to free acid groups) has an acid number between about 20 and about 500, preferably between about 30 and about 330, and more preferably between about 30 and about 130, and analogously the ethylenically unsaturated macromer component preferably has an acid number [of] **between** about 20 and about 650, more preferably between about 90 and about 300 and the majority of the free acid groups are in the branch segments.

On page 6, lines 17, 18, 20 and 34 amend as follows:

The branch segments attached to the linear backbone segment can be derived from ethylenically unsaturated macromers prepared according to the general descriptions in U.S. Patent 4,680,352 and U.S. Patent 4,694,054. Macromers are prepared by free radical polymerization processes employing a cobalt compound as a catalytic chain transfer agent and particularly a cobalt(II) compound. The cobalt(II) compound may be a pentacyanocobalt(II) compound or a cobalt(II) chelate of a vicinal [iminohydroxyimino] **iminohydroxyimino** compound, a dihydroxyimino compound, a diazadihydroxyimminodialkyldecadiene, a [diazadihydroxyimminodialkylundecadiene] **diazadihydroxyiminodialkylundecadiene**, a tetraazatetraalkylcyclotetradecatetraene, a [tetraazatetraalkylcyclododecatetraene] **tetraazatetraalkylcyclododecatetraene**, a bis(difluoroboryl) diphenyl glyoximato, a bis(difluoroboryl) dimethyl glyoximato, a N,N'-bis(salicylidene)ethylenediamine, a dialkyldiaza-dioxodialkyldecadiene, or a dialkyldiazadioxodialkyltridecadiene. Low molecular weight methacrylate macromers may also be prepared with a pentacyanocobalt(II) catalytic chain transfer agent as disclosed in U.S. Patent 4,722,984.

Illustrative macromers using this approach are methacrylate polymers with acrylates or other vinyl monomers wherein the polymers or copolymers have a terminal ethylenic group and a hydrophilic functional group. Preferred monomer components for use in preparing

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macromers include: tertiary-butyl methacrylate (tBMA), tertiary-butyl acrylate (tBA), methyl methacrylate (MMA); ethyl methacrylate (EMA); butyl methacrylate (BMA); 2-ethylhexyl methacrylate; methyl acrylate (MA); ethyl acrylate (EA); butyl acrylate (BA); 2-ethylhexyl acrylate; 2-hydroxyethyl methacrylate (HEMA); 2-hydroxyethyl acrylate (HEA); methacrylic acid ([MA]MAA); acrylic acid (AA); esters of acrylic and methacrylic acid wherein the ester group contains from 1 to 18 carbon atoms; nitriles and amides of acrylic and methacrylic acid (e.g., acrylonitrile); glycidyl methacrylate and acrylate; itaconic acid (IA) and itaconic acid anhydride (ITA), half ester and imide; maleic acid and maleic acid anhydride, half ester and imide; aminoethyl methacrylate; t-butyl aminoethyl methacrylate; dimethyl aminoethyl

On page 8, line 31 amend as follows:

Each constituent linear backbone segment and/or branch segment of the branched polymer of this invention may contain a variety of functional groups. A "functional group" is considered to be any moiety capable of being attached to a backbone segment or a branch segment by a direct valence bond or by a linking group. Illustrative of functional groups which can be borne by the backbone segment or the branch segments are -COOR; -OR; -SR (where R can be hydrogen, alkyl or cycloalkyl of 1-12 carbon atoms, aryl, alkaryl or aralkyl, a heterocyclic, or -OR₁ where R₁ can be alkyl of 1-12 carbon

atoms, aryl, alkaryl or aralkyl); -CN; -NR₂R₃ or $\text{---}\overset{\text{O}}{\underset{\text{||}}{\text{C}}}\text{---NR}_2\text{R}_3$ (where R₂ and

and R₃ can be hydrogen, alkyl or cycloalkyl of 1-12 carbon atoms, aryl, alkaryl, aralkyl, -CH₂OR₄ (where R₄ is hydrogen, alkyl or cycloalkyl of 1-12 carbon atoms, aryl, alkaryl, aralkyl), or together R₂ and R₃ can form a heterocyclic ring);

$\text{---}\overset{\text{R}_5}{\underset{|}{\text{C}}}=\text{CR}_6\text{R}_7$ (where R₅, R₆ and R₇ can be hydrogen, alkyl or cycloalkyl of 1-12

carbon atoms, aryl, alkaryl, aralkyl, or -COOR or when taken together R₅, R₆ and/or R₇ can form a cyclic group); -SO₃H; a urethane group; an isocyanate or blocked isocyanate group; a urea group; an oxirane group; an aziridine group; a quinone diazide group; an azo group; an azide group; a diazonium group; an acetylacetoxy group; -SiR₈R₉R₁₀ (where R₈, R₉ and R₁₀ can be alkyl or cycloalkyl of 1-12 carbon atoms or -OR₁₁ where R₁₁ is alkyl or cycloalkyl of 1-12 carbon atoms, aryl, alkaryl or aralkyl); or an -OSO₃R₁₂, -OPO₂R₁₂, -PO₂R₁₂, -PR₁₂R₁₃R₁₄, -OPOR₁₂, -SR₁₂R₁₃, or -N+R₁₂R₁₃R₁₄ group (where R₁₂, R₁₃ and R₁₄ can be hydrogen, alkyl or cycloalkyl of 1-12 carbon atoms, aryl, alkaryl or aralkyl); or a salt or onium salt of any of the foregoing. Preferred functional groups are [-COON] -COOH, -OH, -NH₂, an amide group, a vinyl group, a urethane group, an isocyanate group, a blocked isocyanate group or combinations thereof. Functional groups may be located anywhere on the

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branched polymer. However, it is sometimes desirable to choose comonomers which impart bulk polymer characteristics to the linear backbone segment of the branched polymer and

On page 17, line 17 amend as follows:

Examples of components having protected acid groups that yield a carboxylic acid as the hydrophilic group upon exposure to photogenerated acid include, but are not limited to, A) esters capable of forming, or rearranging to, a tertiary cation, B) esters of lactone, C) acetal esters, D) β -cyclic ketone esters, E) α -cyclic ether esters, and F) MEEMA (methoxy ethoxy ethyl methacrylate) and other esters which are easily hydrolyzable because of anchimeric assistance. Some specific examples in category A) are t-butyl ester, 2-methyl-2-adamantyl ester, and isobornyl ester. Some specific examples in category B) are γ -butyrolactone-3-yl, γ -butyrolactone-2-yl, mevalonic lactone, 3-methyl- γ -butyrolactone-3-yl, 3-tetrahydrofuranyl, and 3-oxocyclohexyl. Some specific examples in category C) are 2-tetrahydropyranyl, 2-tetrahydrofuranyl, and 2,3-propylenecarbonate-1-yl. Additional examples in category C) include various esters from addition of vinyl ethers, such as, for example, ethoxy ethyl vinyl ether, methoxy ethoxy ethyl vinyl ether, and acetoxy ethoxy ethyl vinyl ether. Examples of components having protected [acid] hydroxyl groups that yield either a phenol or alcohol as the hydrophilic group upon exposure to photogenerated acid or base include, but are not limited to, t-butoxycarbonyl (t-BOC), t-butyl ether, and 3-cyclohexenyl ether.

On page 20, line 13 amend as follows:

The photoresist compositions of this invention are sensitive in the ultraviolet region of the electromagnetic spectrum and especially to those wavelengths ≤ 367 nm. Imagewise exposure of the resist compositions of this invention can be done at many different UV wavelengths including, but not limited to, 365 nm, 248 nm, 193 nm, 157 nm, and lower wavelengths. Imagewise exposure is preferable done with ultraviolet light of 248 nm, 193 nm, 157 nm, or lower wavelengths; is more preferable done with ultraviolet light of 193 nm, 157 nm, or lower wavelengths; and is still more preferably done with ultraviolet light of 157 nm or lower wavelengths. Imagewise exposure can either be done digitally with a laser or equivalent device or non-digitally with use of a photomask. **[Digital imaging with a laser is preferred.]** Suitable laser devices for digital imaging of the compositions of this invention include, but are not limited to, an argon-fluorine excimer laser with UV output at 193 nm, a krypton-fluorine excimer laser with UV output at 248 nm, and a fluorine (F₂) laser with output at 157 nm. Since, as discussed supra, use of UV light of lower wavelength for imagewise exposure corresponds to higher resolution (lower resolution limit), the use of a lower wavelength (e.g., 193 nm or 157 nm or lower) is generally preferred over use of a higher wavelength (e.g., 248 nm or higher). Specifically, imaging at 157 nm is preferred over imaging at 193 nm for this reason.

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On page 21, line 32 amend as follows:

GLOSSARY

Chemicals/Monomers

AA	Acrylic acid Aldrich Chemical Co., Milwaukee, WI
1-AdA	1-Adamantyl acrylate
AIBN	2,2'-azobisisobutyronitrile Aldrich Chemical Co., Milwaukee, WI
AMS	alpha-Methyl styrene Aldrich Chemical Co., Milwaukee, WI
AMSD	alpha-Methyl styrene dimer Goi Chemicals Ltd., Houston, TX
BuAc	n-Butyl acetate Aldrich Chemical Co., Milwaukee, WI
DMG Co(III)	Isopropyl-bis([<u>borondimethylglyoximate</u>] <u>borondifluoromethylglyoximate</u>)cobaltate (III)
Catalyst	E. I. du Pont de Nemours, Sydney, Australia
HEMA	2-Hydroxyethyl methacrylate Aldrich Chemical Co., Milwaukee, WI
HMDS	Hexamethyldisilazane Aldrich Chemical Co., Milwaukee, WI

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↙

On page 46, lines 28 and 36 amend as follows:

EXAMPLE 25

A photoresist composition was made at 26% solids as in Example 22, except that 15.4 gm of a solution of the graft copolymer of Example 17 was used in place of the graft copolymer solution of Example 12, and 14.6 gm of PGMEA was used. The photoresist was processed as in Example 22 to give a positive image. Resist coating quality was cloudy and nonuniform, but it did develop in 60 sec., and better than the corresponding random polymer in Example [27] 26.

EXAMPLE 26

A photoresist composition was made at 26% solids as in Example 22, except that 18.4 gm of a solution of the random copolymer of Example 18, which has the same overall composition of the graft copolymer of Example 17, was used in place of the graft copolymer solution of Example 12, and 11.6 gm of PGMEA was used. The photoresist was processed as in Example 22 to give a positive image. Resist coating quality was much poorer, and imaging/development was significantly poorer, than the graft copolymer in Example [26] 25.

On page 53, in the first table on the page, amend as follows:

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Parts by Weight	Grams
Portion 1	
tBMA	6.59
IBOMA	28.17
HEMA	6.59
MEK	49.45
Portion 2	
IBOMA	79.12
[TBMA] <u>tBMA</u>	26.37
HEMA	26.37
Portion 3	
Vazo® 52 Initiator	3.30
MEK	82.42
Total	300.00

On page 56, line 3 in the heading, amend as follows:

EXAMPLE 44

Effect of Monomer Composition on Optical
Transparency in the [DUV] EUV:

new matter!

On page 57 in the second table on the page, amend as follows:

Parts by Weight	Grams
Portion 1	
Macromonomer (Example [10] <u>45A</u>)	169.56
Isobornyl acrylate (IBA)	25.52
Methyl acrylate (MA)	3.65
Acrylic acid (AA)	3.65
t-Butyl acrylate (tBA)	3.65
MEK	84.23

On page 59 in the table, amend as follows:

Parts by Weight	Grams
Portion 1	
Macromonomer (Example [10] <u>45A</u>)	169.56

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Isobornyl acrylate (IBA)	30.98
Acrylic acid (AA)	5.47
MEK	84.23
Portion 2	
t-butyl peroxyvalerate	2.21
MEK	11.67
Portion 3	
Isobornyl acrylate (IBA)	138.30
Acrylic acid (AA)	24.41
Portion 4	
t-butyl peroxyvalerate	2.21
MEK	22.12
Portion 5	
t-butyl peroxyvalerate	4.42
MEK	4.42
Total	500.00

On page 60 in the table, amend as follows:

Parts by Weight	Grams
Portion 1	
Macromonomer (Example [10] 45A)	169.56
Isobornyl acrylate (IBA)	23.69
Methyl acrylate (MA)	3.64
Acrylic acid (AA)	3.64
MEK	84.23
Portion 2	
t-butyl peroxyvalerate	2.21
MEK	11.67
Portion 3	
Isobornyl acrylate (IBA)	130.14
Methyl acrylate (MA)	16.27
Acrylic acid (AA)	16.27
Portion 4	
t-butyl peroxyvalerate	2.21
MEK	22.12
Portion 5	
t-butyl peroxyvalerate	4.42

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MEK	4.42
Total	500.00

On page 61 in the table, amend as follows:

Parts by Weight	Grams
Portion 1	
Macromonomer (Example [10] <u>45A</u>)	169.56
Isobornyl acrylate (IBA)	23.69
Acrylonitrile	7.29
Acrylic acid (AA)	5.47
MEK	84.23
Portion 2	
t-butyl peroxyvalate	2.21
MEK	11.67
Portion 3	
Isobornyl acrylate (IBA)	105.76
Acrylonitrile (AN)	32.54
Acrylic acid (AA)	24.41
Portion 4	
t-butyl peroxyvalate	2.21
MEK	22.12
Portion 5	
t-butyl peroxyvalate	4.42
MEK	4.42
Total	500.00

On page 62 in the table, amend as follows:

Parts by Weight	Grams
Portion 1	
Macromonomer (Example [10] <u>45A</u>)	169.56
Isobornyl acrylate (IBA)	36.45
MEK	84.23
Portion 2	
t-butyl peroxyvalate	2.21

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MEK	11.67
Portion 3	
Isobornyl acrylate (IBA)	162.70
Portion 4	
t-butyl peroxyvalate	2.21
MEK	22.12
Portion 5	
t-butyl peroxyvalate	4.42
MEK	4.42
Total	500.00

On page 63, line 16 amend as follows:

EXAMPLE 50

The following formulation was prepared and magnetically stirred overnight.

<u>Component</u>	<u>Wt. (gm)</u>
Copolymer described in Example 45, [70] IBA/MA/tBA/AA 70/10/10/10 // [30] MMA/tBMA/MAA 40/40/20, which had been solvent exchanged with PGMEA as follows. Thus, to 100.0 gm of the copolymer solution in Example 45B (60.3% Solids in MEK) was added 140.7 gm PGMEA, and rotary evaporated under vacuum to a net weight of 201.0 gm (30% Solids)	7.3
Propylene glycol methyl ether acetate (PGMEA)	5.3
Cyclohexanone	7.5
t-Butyl Lithocholate	2.18
5% (wt) solution of triphenylsulfonium triflate dissolved in cyclohexanone which was filtered through a 0.45 μ PTFE syringe filter.	2.70

IN THE CLAIMS:

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1. A positive-working photoresist comprising:

(A) a branched polymer containing protected acid groups, said polymer comprising one or more branch segment(s) chemically linked along a linear backbone segment, wherein the branch segment(s) contain at least two repeating monomer units and have a number average molecular weight (M_n) of at least 1000; and

(B) at least one photoacid generator.

13. The photoresist of Claim 1 wherein

- (a) the ethylenically unsaturated macromer component has a number average molecular weight (M_n) in the range of [500 to 40,000] 1000 to 15,000;
- (b) the linear backbone segment has a number average molecular weight (M_n) between about 2,000 and about 500,000; and
- (c) the weight ratio of the linear backbone segment to the branch segment(s) is within a range of about 50/1 to about 1/10.

7. 16. (Once Amended) The photoresist of Claim 1 wherein the branched polymer is an acrylic/methacrylic/styrenic copolymer being at least 60% by weight acrylate and having at least 60% of methacrylate repeat unit[s] content present in the copolymer [either] in a first location [or a second location], the first location being one of the segments, the second location being a segment different from the first location; wherein at least 60% of the acrylate repeat unit[s] content in the copolymer is [are] present in the second location.

17. 18. The photoresist of Claim 1 wherein the branched polymer is a fluorine-containing copolymer comprising a repeat unit derived [form] from at least one ethylenically unsaturated compound containing at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom.

27. A process for preparing a photoresist image on a substrate comprising, in order:

(W) applying a photoresist composition on a substrate, wherein the photoresist composition comprises:

(a) a branched polymer containing protected acid groups, said polymer comprising one or more branch segment(s) chemically linked along a linear backbone segment, wherein the branched polymer contains sufficient functionality to render the photoresist developable to afford a relief image, upon imagewise exposure to radiation selected from the group consisting of ultraviolet and violet and subsequent heating, wherein the branch segment(s) contain at least two repeating monomer units and have a number average molecular weight (M_n) of at least 1000;

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- (b) at least one photoacid generator; and
- (c) a solvent;
- (X) drying the coated photoresist composition to remove solvent and thereby to form a photoresist layer on the substrate;
- (Y) imagewise exposing the photoresist layer to form imaged and non-imaged areas; and
- (Z) developing the exposed photoresist layer having imaged and non-imaged areas to form the relief image on the substrate.

34. (NEW) The photoresist of Claim 1 wherein the branched polymer is an acrylic/methacrylic copolymer being at least 60% by weight acrylate and having at least 60% of methacrylate repeat unit present in a first location, the first location being one of the segments, the second location being a segment different from the first location, wherein at least 60% of the acrylate repeat unit content in the copolymer is present in the second location.